

REMARKS

Claims 1-15, 17, and 19-21 are pending in the present patent application. Claims 1-15, 17, and 19-21 stand rejected. By this amendment, claims 9 and 15 have been amended, and claims 22-24 have been added. This application now includes claims 1-15, 17, and 19-24.

In an Advisory Action, mailed December 31, 2002, the Examiner indicated, that, for purposes of appeal, claims 8-14 were allowed. The indication of allowance of claims 8-14 was withdrawn in the present office action.

In a previous Amendment, mailed December 31, 2001, Applicants' amended claims 1, 5, and 8. In aforementioned Advisory Action, the Examiner indicated that the amendments would not be entered because they raised new issues that would require further consideration and/or search. On January 21, 2003, Applicants submitted a Request for Continued Examination, including a request that the amendment previously filed on December 31, 2001 be considered. In a telephone conversation on June 9, 2003, the Examiner confirmed that the amendments were entered.

Claims 1-5 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 5,821,961) in view of Harvey (U.S. Patent 5,779,837). Applicants respectfully disagree with the stated grounds for the rejection of each claim, and request reconsideration of the rejection of claims 1-5 and 8 in view of the following.

Sato is directed to an ink jet head (col. 1, line 7), and, more particularly, to one that can be inexpensively produced without using extremely high precision assembly equipment (col. 2, lines 17-19). Sato discloses a grooved top plate 1350, with the grooves providing plural ink paths (col. 3, lines 62-63, Fig. 2), a heater board 100 (col. 4, line 8), and a support member 300 for supporting the heater board 100 (col. 4, line 15). The heater board 100 is

glued to the support member 300 (col. 4, line 19), and the heater board is joined with grooved top plate 1350 (col. 4, lines 35-39). Sato discloses positioning references 1350T and 1350C, and positioning projections 2500N and 2600N, and teaches that these referential surfaces are integrally molded with ink paths 30R, so that their positional errors relative to the ink paths 30R remain within 10 μm (col. 4, line 53 to col. 5, line 24). The referential surfaces are employed in all three embodiments disclosed by Sato (col. 3, lines 16-29 and lines 36-37, with reference to Figs. 1-4 and 7). In one embodiment, Sato discloses that adhesive with elasticity must be employed as adhesive 306, which is used to join the heater board and support member 300 (col. 5, lines 52-54).

Harvey is directed to a method for bonding ink jet printheads during assembly (col. 1, lines 4-7). Harvey discloses a base 10 of piezo-electric material that is bonded to a cover 16 (col. 2, lines 57-61). A multiplicity of parallel grooves 18 are formed in the base 10 extending into the layer of piezo-electric material (col. 2, lines 64-65). Base 10 has a forward part in which the grooves are comparatively deep to provide ink channels 20 separated by opposing actuator walls 22 (col. 3, lines 1-3). Base 10 includes outer walls 30 of the printhead (col. 3, line 67 to col. 4, line 1, Fig. 3).

Harvey discloses that having a thick glue film provides too great a bond compliance (col. 4, lines 19-20). Accordingly, a number of grooves 32 are formed in the outer wall 30 to provide a channel into which excess glue may flow, so that intimate conformity in the region of the outer wall 30 is obtained as readily as on the tops of the actuator walls (col. 4, lines 49-52, Fig. 4). Harvey discloses that, if excess glue is provided in the quantity to fill the grooves 32, it can more readily flow along the grooves and escape, avoiding build-up of hydrostatic pressure between the mating parts (col. 4, lines 52-55). Harvey also discloses that the grooves

make it easier to regulate the application of a quantity of glue in excess to ensure successful bond formation, without the deleterious compliance effects to the active walls (col. 4, lines 55-59).

Applicants believe that claims 1-5 and 8 patentably define Applicants' invention over the cited references, Sato in view of Harvey, taken alone or in combination, for the reasons set forth below.

Claim 1 is directed to an ink jet printhead assembly. Claim 1 recites, a heater chip including a backside with at least one cavity; a substrate associated with said backside of said heater chip, said substrate having a substantially flat surface opposing said at least one cavity; and adhesive at least partially disposed within said at least one cavity, said adhesive adhering said backside of said heater chip to said substantially flat surface of said substrate. The Examiner concedes that Sato "fails to teach the heater chip having a cavity and adhesive at least [partially] disposed within the at least one cavity." However, the Examiner asserts that it would have been obvious to one having ordinary skill in the art at the time the invention was made "to modify the teaching of Sato to have the groove/cavity on the heater chip as taught by Harvey." The Examiner asserts that the motivation for such a modification would be "to provide a channel into which excess glues may flow, further if excess glue is provided in the quantity to fill the grooves, it can more readily flow along the grooves and escape." The Applicants respectfully disagree with the Examiner's assertions for the reasons that follow.

Sato is directed to an ink jet head (col. 1, line 7) that can be inexpensively produced without using extremely high precision assembly equipment (col. 2, lines 17-19). In order to solve Sato's stated problem, Sato discloses positioning references 1350T and 1350C, and positioning projections 2500N and 2600N, and teaches that these referential surfaces are

integrally molded with ink paths 30R, so that their positional errors relative to the ink paths 30R remain within 10 μm (col. 4, line 53 to col. 5, line 24). However, Sato does not disclose, teach, or suggest the existence of a problem associated with excess adhesive flow. Hence, there would be no motivation to modify Sato with the teaching of Harvey, “to provide a channel into which excess glues may flow, further if excess glue is provided in the quantity to fill the grooves, it can more readily flow along the grooves and escape,” as asserted by the Examiner.

In addition, Applicants respectfully submit that the apparatus’ of Harvey and Sato are incompatible, and have different requirements. For example, Harvey discloses a base 10 of a piezo-electric device that is bonded to a cover 16 (col. 2, lines 57-61), but that having a thick glue film provides too great a bond compliance (col. 4, lines 19-20), i.e., a bond that is too elastic, and therefore, will not pass the test (col. 4, lines 20-23). In contrast, Sato discloses a heater board 100 (col. 4, line 8), but teaches, in one embodiment, that adhesive with elasticity must be used to join the heater board and support member 300 (col. 5, lines 52-54).

Accordingly, Applicants respectfully submit that the teachings of Sato and Harvey are incompatible, and thus, there would be no motivation to modify the Sato apparatus with the teachings of Harvey.

Accordingly, for at least the reasons set forth above, it would not have been obvious to one having ordinary skill in the art at the time the invention was made to modify “the teaching of Sato to have the groove/cavity on the heater chip as taught by Harvey,” as asserted by the Examiner. Applicants therefore respectfully submit that claim 1 is patentable in its present form.

Claims 2-5 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 1. In addition, claims 2-5 further and patentably define the invention over the cited references.

For example, claim 5 is directed to the printhead assembly of claim 2, wherein said heater chip includes a plurality of ink vias, said adhesive being configured for preventing fluid communication between said plurality of ink vias in an area defined between said heater chip and said substrate. The cited references do not disclose, teach, or suggest the adhesive being configured for preventing fluid communication between the plurality of ink vias in an area defined between the heater chip and the substrate, as recited in claim 5.

Further, Harvey clearly discloses that the problem sought to be addressed by the Harvey apparatus is bond compliance, which is associated with the thickness of the glue film. For example, Harvey discloses that the compliance ratio of the bond layer, which is directly proportional to the thickness of the bond layer, should be less than one, and preferably less than 0.1 (col. 3, lines 34-40). If the glue film remains thick over a group of actuator walls at the edge of the printhead 10, the result is that the bond compliance at the top of the walls is too great (col. 4, lines 18-23). Accordingly, Harvey is addressed to solving problems associated with the thickness of the glue film, which is dimensionally orthogonal to the area between the plurality of ink vias, as recited in claim 5.

The Examiner asserts that it is inherent that the adhesive would be configured to prevent fluid communication between the plurality of ink vias in an area defined between the heater chip and the substrate. The Applicants respectfully disagree, for the reasons that follow.

To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *In re Robertson*, 169 F.3d 734, 49 USPQ2d 1949 (Fed. Cir. 1999). Here, Sato discloses that plural ejection orifices 30 are exposed to a common liquid chamber 1301 (col. 3, line 67 to col. 4, line 1, and Fig. 2). In addition, Harvey discloses a cover 16 that allows ink to enter ink channels 20, wherein all the vias are exposed to the opening in the cover (Fig. 1). Thus, both the Sato and Harvey devices supply ink to the vias via a common source, and there would thus be no need to prevent fluid communication between plurality of the vias, as recited in claim 5. Applicants thus respectfully submit that preventing fluid communication between the plurality of ink vias, as recited in claim 5, is not necessarily present in either the Sato or Harvey disclosure.

In contrast to Sato and Harvey, Applicants disclose, for example, that since each of the vias may carry a different color ink, sealing between ink vias 56 is crucial to prevent cross contamination between different colored inks (Applicants' specification at page 5, lines 5- 6).

Accordingly, Applicants respectfully submit that it is not inherent, in the asserted modification of Sato in view of Harvey, that the adhesive would be configured to prevent fluid communication between the plurality of ink vias in an area defined between the heater chip and the substrate, as recited in claim 5. Accordingly, claim 5 is believed allowable in its own right.

Claim 8 is directed to an ink jet printhead assembly. Claim 8 recites a heater chip including a backside with at least one cavity; a substrate associated with said backside of said heater chip, said substrate having a substantially flat surface; and adhesive substantially

entirely disposed within said at least one cavity, said adhesive adhering said backside of said heater chip to said substantially flat surface of said substrate.

Claim 8 is believed allowable for substantially the same reasons as set forth above with respect to claim 1. In addition, Sato in view of Harvey does not disclose, teach, or suggest the adhesive being substantially entirely disposed within the at least one cavity, as recited in claim 8. For example, and without intent to limit Applicants' invention of claim 8, Applicants disclose, at page 4, lines 26-30, that the presence of trench 42 on the backside of silicon chip 40 enables tight control over where die attach adhesive 18 is allowed to flow, which provides a very accurate and precise bond line, and that adhesive 18 may be entirely contained within the trench 42, thereby further increasing the accuracy and precision of the bond line. In contrast to claim 8, Harvey discloses that the grooves 32 are formed in the outer wall 30 to provide a channel into which excess glue may flow, (col. 4, lines 49-52, Fig. 4). Hence, it is clear that the Harvey adhesive is disposed between the grooves 32, with merely the excess glue flowing into the grooves. In addition, as conceded by the Examiner, Sato fails to teach the heater chip having a cavity.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit that the cited references, Sato and Harvey, do not disclose, teach, or suggest the subject matter of claims 1-5 and 8, and thus respectfully request that the rejection of claims 1-5 and 8 under 35 U.S.C. 103(a) be withdrawn.

Claims 6-7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sato in view of Harvey, and in further view of Brandon, et al. (U.S. Patent 5,751,324). Claims 6-7 are believed allowable due to their dependence, indirectly, on otherwise allowable base claim 1. Accordingly, Applicants believe that claims 6-7 are in condition for allowance in their

present form, and thus respectfully request that the rejection of claims 6-7 under 35 U.S.C. 103(a) be withdrawn.

Claims 9-12, 15, and 16 were rejected under pre-AIPA 35 U.S.C.102(e) as being anticipated by Kobayashi, U.S. Patent 6,033,581. Applicants make note to the Examiner that Applicants had cancelled claim 16 in Applicants' Amendment, dated September 21, 2001, and thus construe the Examiner's rejection as pertaining to claims 9-12, and 15. Applicants respectfully disagree with the stated grounds for the rejections of each claim, and request reconsideration of the rejection of claims 9-12, and 15 in view of the following.

Kobayashi is directed to a process for producing an ink jet recording head (col. 1, lines 7-8). Kobayashi discloses a silicon substrate 1 (Fig. 3) on which ink discharge pressure elements 5, ink flow paths and discharge openings 4 have been formed (col. 3, lines 24-26). Silicon substrate 1 includes an ink feed opening 2 and a groove 3 formed around ink feed opening 2 (col. 3, lines 28-29). Thermal oxidized film 10 (Fig. 7) is processed by photolithography, using a photomask 12 (Fig. 9) having a pattern corresponding to ink feed openings 2 and grooves 3 that are formed around openings 2, and is intended to prevent the adhesive from flowing (column 3, line 63 through column 4, line 1). A support 6 (Fig. 4) is made of aluminum, and includes ink feeding holes 8, with protrusions 7 surrounding ink feeding holes 8, which respectively face openings 2 and grooves 3 (col. 5, lines 39-41). Ink feeding holes 8 and protrusions 7 are formed by mechanical processing (col. 5, line 42). An adhesive 9 (Fig. 6) is coated on the outskirts of protrusions 7, and thereafter the silicon substrate 1 on which the anisotropic etching has been completed is put together and bonded (column 5, lines 38-46). As shown in Fig. 6, the adhesive 9 extends from groove 3 to the

outside edge of silicon substrate 1, with the vast majority of the adhesive being present outside of groove 3.

Applicants believe that claims 9-12, and 15 patentably define Applicants' invention over the cited reference, Kobayashi, for the reasons set forth below.

Claim 9 is directed to a heater chip assembly for use in an ink jet printhead. Claim 9, as amended, recites, in part, adhesive substantially entirely contained within said at least one cavity, said adhesive configured for adhering said backside of said heater chip to a substrate. Support for this amendment is found in Applicants' specification at page 4, lines 26-30. In contrast to claim 9, Kobayashi discloses in Fig. 6, that when substrate 1 is assembled to support 6 for bonding, the adhesive 9 is substantially entirely disposed outside of grooves 3. Applicants respectfully submit the Kobayashi does not disclose or suggest that the adhesive is substantially entirely contained within the at least one cavity, as recited in claim 9, as amended. Accordingly, claim 9 is believed allowable in its present form.

Claims 10-12 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 9.

Claim 15 is directed to a method of assembling an ink jet printhead. Claim 15, as amended, recites, in part, adhering said backside of said heater chip to a substantially flat surface of a substrate such that adhesive is at least partially disposed within said at least one cavity. In contrast to claim 15, Kobayashi discloses a support 6 (Fig. 4) that includes protrusions 7 facing grooves 3 in substrate 1 (col. 5, lines 39-41, and Fig. 5). Applicants respectfully submit that a support having protrusions, such as protrusions 7 on support 6 does not disclose, teach, or suggest a substantially flat surface of a substrate, as recited in claim 15.

In addition, claim 15, as amended, recites, in part, micromachining at least one cavity in a backside of a heater chip, said heater chip including a plurality of vias, each of said at least one cavity surrounding a corresponding one of said plurality of vias, said at least one cavity being configured to reduce a width of a bond line between adjacent vias of said plurality of vias. Kobayashi does not disclose, teach, or suggest the at least one cavity being configured to reduce a width of a bond line between adjacent vias of said plurality of vias, as recited in amended claim 15.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit that the cited reference, Kobayashi, does not disclose, teach, or suggest the subject matter of claim 15, as amended. Support for the amendment of claim 15 is found throughout Applicants' specification as originally filed, and more particularly, from page 4, line 19 to page 5, line 12.

Accordingly, for at least the reasons set forth above, Applicants believe that claims 9-12 and 15 are in condition for allowance in their present form, and thus respectfully request that the rejection of claims 9-12 and 15 under 35 U.S.C. 102(e) be withdrawn.

Claims 13-14 and 21 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi in view of Brandon, et al. Claims 13-14 are believed allowable due to their dependence, indirectly, on otherwise allowable base claim 9. Claim 21 is believed allowable due to its dependence, indirectly, on otherwise allowable base claim 15. Accordingly, Applicants believe that claims 13-14 and 21 are in condition for allowance in their present form, and thus respectfully request that the rejection of claims 13-14 and 21 under 35 U.S.C. 103(a) be withdrawn.

Claim 17 was rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi in view of Mey, et al. (U.S. Patent 5,821,972). Claim 17 is believed allowable due to its dependence on otherwise allowable base claim 15. Accordingly, Applicants believe that claim 17 is in condition for allowance in its present form, and thus respectfully request that the rejection of claim 17 under 35 U.S.C. 103(a) be withdrawn.

Claims 22-24 have been added in order to provide Applicants with the scope of protection to which Applicants are entitled. Applicants believe that claims 22-24 patentably define Applicants' invention over the cited references, Kobayashi, Sato, Harvey, Brandon, et al., and Mey, et al. Support for the addition of claims 22-24 is found throughout Applicants' specification as originally filed, and more particularly, from page 4, line 19 to page 5, line 12.

For the foregoing reasons, Applicants submit that the pending claims are in condition for allowance in their present form, and Applicants respectfully request withdrawal of all rejections and allowance of the claims.

In the event Applicants have overlooked the need for an extension of time, an additional extension of time, payment of fee, or additional payment of fee, Applicants hereby conditionally petition therefor and authorize that any charges be made to Deposit Account No. 20-0095, TAYLOR & AUST, P.C.

Should any question concerning any of the foregoing arise, the Examiner is invited to telephone the undersigned at (317) 894-0801.

Respectfully submitted,



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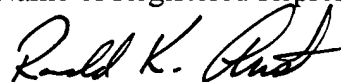
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